Enabling Self-Propelled Condensate Flow During Phase-Change Heat Rejection Using Surface Texturing

Completed Technology Project (2013 - 2016)

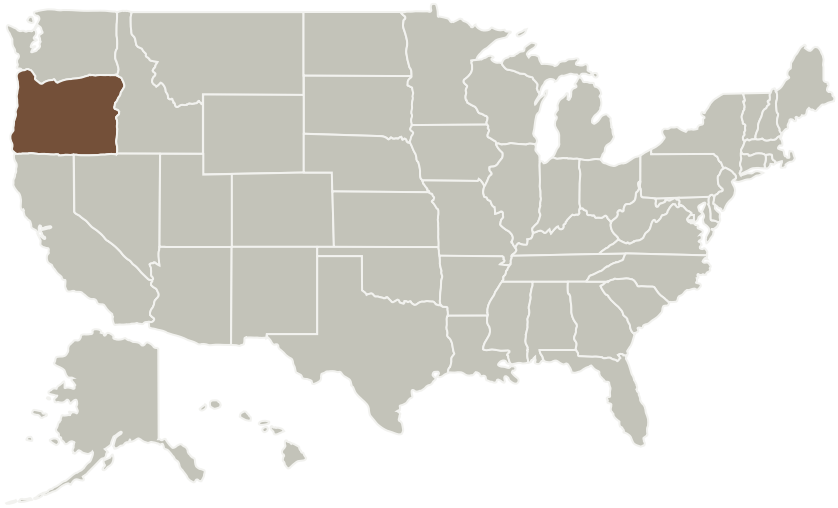
Project Introduction

A collaborative project between Oregon State University and Auburn University is proposed on the topic of heat rejection. A unique and innovative method of phase-change heat rejection (condensation) suitable for microgravity environment is proposed. The overall objective is to characterize the effects of surface microstructures on film dynamics and heat transfer rate by variation of the microstructure size or surface conditions. The key innovation lies in the surface microstructure design of the condenser, which is in the form of repeating asymmetric ratchets. Together with an innovative evaporator design that is being currently developed by the PIs, the condenser will result in a phase-change thermal management loop that is capable of removing moderate heat fluxes, is passive with no electrical input or moving parts, is self-regulating, reliable and lightweight. The proposed technology is expected to exit the project period at TRL 2.

Anticipated Benefits

Together with an innovative evaporator design that is being currently developed by the PIs, the condenser will result in a phase-change thermal management loop that is capable of removing moderate heat fluxes, is passive with no electrical input or moving parts, is self-regulating, reliable and lightweight.

Primary U.S. Work Locations and Key Partners



Project Image Enabling Self-Propelled Condensate Flow During Phase-Change Heat Rejection Using Surface Texturing

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Organizations Performing Work	Role	Type	Location
Oregon State University	Supporting Organization	Academia	Corvallis, Oregon

Primary U.S. Work Locations
Oregon

Images

11965-1363028376337.jpg
Project Image Enabling Self-Propelled Condensate Flow During Phase-Change Heat Rejection Using Surface Texturing
(https://techport.nasa.gov/image/1694)

Project Website:

https://www.nasa.gov/directorates/spacetech/home/index.html

Organizational Responsibility

Responsible Mission Directorate:
Space Technology Mission Directorate (STMD)

Responsible Program:
Space Technology Research Grants

Project Management

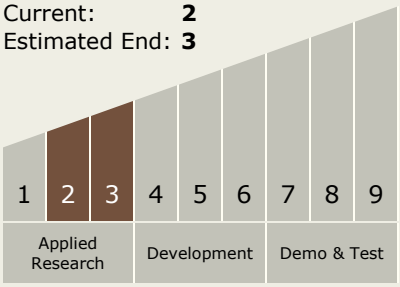
Program Director:
Claudia M Meyer

Program Manager:
Hung D Nguyen

Principal Investigator:
Vinod Narayanan

Technology Maturity (TRL)

Start: **2**
Current: **2**
Estimated End: **3**



Technology Areas

Primary:

Continued on following page.

Technology Areas *(cont.)*

- TX14 Thermal Management Systems
  - TX14.2 Thermal Control Components and Systems
    - TX14.2.3 Heat Rejection and Storage